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Non-destructive testing — Ultrasonic thickness determination

Essais non destructifs — Détermination de l'épaisseur par ultrasons

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Foreword

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This document was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 3, *Ultrasonic testing,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 138, *Non-destructive testing,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 16809:2017), which has been technically revised.

The main changes are as follows:

— terminology in the document has been modified, changing "measurement" to "determination";

— terminology has been aligned with ISO 16831;

— ultrasonic instruments with A-scan presentation that conform with ISO 22232-1 can be used to determine wall thicknesses;

— all figures have been improved.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Non-destructive testing — Ultrasonic thickness determination

1 Scope

This document specifies principles for determination of the thickness of metallic and non-metallic materials using the contact technique or immersion technique, based on measurement of the time of flight of ultrasonic pulses only.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5577, *Non-destructive testing — Ultrasonic testing — Vocabulary*

ISO 16831, *Non-destructive testing — Ultrasonic testing — Characterization and verification of ultrasonic equipment for the determination of thickness*

ISO 22232-1, *Non-destructive testing — Characterization and verification of ultrasonic test equipment — Part 1: Instruments*

ISO 22232-2, *Non-destructive testing — Characterization and verification of ultrasonic test equipment — Part 2: Probes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5577 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Modes of determination

The thickness of a test object is determined by accurately measuring the time required for a short ultrasonic pulse generated by a transducer to travel through the thickness of the material once, twice or several times.

The material thickness is calculated by multiplying the known sound velocity of the material of the test object with the measured time of flight and dividing by the number of times the pulse transits the material wall.

This principle can be accomplished by applying one of the following modes (see Figure 1).

a) Mode 1: measure the time of flight from an initial excitation pulse to a first returning echo, minus a zero-point correction to account for the thickness of the probe's wear plate or delay path and the couplant layer (single-echo mode).

b) Mode 2: measure the time of flight from the end of a delay line to the first back wall echo (single-echo delay line mode).

c) Mode 3: measure the time of flight between back wall echoes (multiple-echo mode).

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